Stressors Assessment: Draft Bay Delta Conservation Plan

A. General Information:

1. Name or Location of Example/Approach: Bay Delta Conservation Plan

2. Literature/Citations Used: November 18, 2010 Working Draft, Bay Delta Conservation Plan

3. Reviewer(s): M. Healey, J. Mount

B. Specific Questions:

1. What stressors are considered?

The Bay Delta Conservation Plan (BDCP) is an effort to seek regulatory authority for operation of the State Water Project, the Central Valley Project and the Mirant Powerplant. Operations of these three projects affect multiple aquatic and terrestrial species listed under Federal and State Endangered Species Acts. The goal of the Plan is to serve as the basis of a Natural Communities Conservation Plan under the State Endangered Species Act and a Habitat Conservation Plan under the Federal Endangered Species Act.

The Working Draft Bay Delta Conservation Plan explicitly identifies a suite of stressors that are affecting populations of species that are covered by the Plan. They lump the stressors into two broad categories: those that will be addressed by conservation actions by and within the project, and those that lie outside of the purview of the plan. These latter stressors are referred to as "other stressors".

2. Are stressors categorized? If so, how?

The biological objectives for the plan are based upon the stressors identified as impacting covered species. These stressors identified are grouped into two broad categories, with a total of 14 stressor types (Table 1). Under stressors to be addressed by the Plan, there are ten: habitat loss, food limitation, altered flows, migration barriers, water quality, entrainment, predators/non-native invasive species, illegal harvest, floodplain stranding and dredging. Other stressors not addressed by the biological objectives of the plan include: loss of access to historical spawning sites (due to dams, diversions), climate change, disease, and ocean conditions.

It should be noted that although the NCCP/HCP regulations require addressing all communities affected by the project, the emphasis of the approach to stressors is focused on aquatic communities. This is reasonable since these are the communities most directly affected by project operations.

Table 1: Stressors on Covered Fish Species Addressed by BDCP Biological Objectives*

Applicable Species	Stressors	Description
1) CHSA, STEE, SASP, GRST, WHST, RILA, PALA	Habitat loss and modification	Changes in the extent access to and or quality of key natural in-Delta habitats for specific life history stages, including habitat variability and food.
2) SASP	Food limitation	Food availability and food web disruptions due to altered co-occurrence with prey or due to effects of foraging by overbite clam.
3) CHSA, STEE, GRST, WHST, RILA, PALA	Altered flows	Altered distribution due to diversions and gate operations; modifications to Delta inflow and outflow rates and hydrodynamics resulting in deviations from migration pathways delays reduced survival and adult straying; rapid changes in flows and water levels affecting rearing habitat and outmigration success; directionality of flows thru the Delta
4) CHSA, STEE, GRST, WHST, RILA, PALA	Passage impediments/ barriers	Barriers to migration (upstream and downstream); factors within the Planning Area that reduce or eliminate access to key habitats.
5) CHSA, STEE, SASP, GRST, WHST, RILA, PALA	Water quality (toxics, DO, temperature)	Effects of contaminants and toxic compounds on all life stages; effect of water temperature on productivity; effect of microcystis blooms on productivity; effect of water quality on distribution migration growth rate and reproductive success and survival (including predation).
6) CHSA, SASP, GRST, WHST	Entrainment	Direct mortality due to entrainment or impingement at project and non-project diversions.
7) CHSA, STEE, SASP	Predators/non-native invasive species	Predation losses including effects of structures and habitat alterations that promote predators including population effects from predation by introduced species (Note: this is a low impact stressor – little information available for splittail); Competition predation or alteration of habitat characteristics from nonnative invasive species.
8) CHSA, STEE, SASP, GRST, WHST	Illegal harvest	Direct mortality due to illegal harvest; population effects from illegal harvest.
9) SASP, RILA, PALA	Stranding	Effects on productivity and abundance from incidences of stranding associated with water management activities. Splittail are floodplain spawners. Design of the restored floodplain may influence potential for stranding.
10) GRST, WHST	Dredging	Disturbance of benthos and direct and indirect effects of physical disturbances of substrates used for rearing from dredging activities associated with BDCP construction and maintenance activities.

Stressors Not Addressed by BDCP Biological Objectives

Applicable Species	Stressors	Description
11) CHSA, STEE	Access to historical spawning habitat	Barriers to historical spawning habitat are predominately located outside of the BDCP planning area. In-delta migration and barriers addressed in Stressor # 4 above.
12) CHSA, STEE	Climate change	Increases in ambient air temperatures resulting in increased water temperatures with negative effects on habitat suitability. Effects of climate change are considered but no specific objectives proposed. Changes in water temperature as applicable to BDCP covered activities are addressed under stressor # 5 above.
13) RILA, PALA	Disease	Disease may influence lamprey health with effects on reproduction and survival.
14) RILA, PALA	Ocean conditions	Reductions in the availability of host/food species may be affecting lamprey survival and growth.

CHSA = Chinook salmon all runs
STEE = Central Valley steelhead
SASP = Sacramento splittail
GRST = Green sturgeon
WHST = White sturgeon
RILA = River Lamprey
PALA = Pacific Lamprey

*Modified from the November 18, 2010 Working Draft for the Bay Delta Conservation Plan

3. Are the relations between stressors and management objectives modeled, and if so, how?

The Working Draft Plan uses a concept called a "logic chain" as a framework for linking goals for recovery of covered fish species with conservation measures. The current logic chain, developed principally by BDCP science advisors and extensively reviewed by DISP panels, also attempts to link objectives and conservation measures to an array of metrics, to help guide adaptive management.

As outlined in the Plan and supporting documentation, the logic chain approach organizes and evaluates the links between Plan objectives and stressors affecting covered species. The

strength of this approach is that it is systematic, and attempts to identify the relationship between multiple stressors as well as the response of all covered species to conservation actions (the latter seeks to avoid actions that harm some species while enhancing conditions for others: a common concern in Delta management).

The logic chain as developed in the Plan steps through a series of questions about the stressors affecting each species. The structure of the logic chain appears as follows:

Species

Stressor:

BDCP Objective:

- **Relation to Global Objectives (objectives that impact many species)**
- **Indicator (extent and quality habitat, flows, water quality, etc.)**
- **Geographic Locations**
- **Timing of stressor reduction (seasonality)**
- **Attribute (e.g., spatial extent of habitat)**
- **Quality (e.g., temperature, substrate quality)**
- **Quantity or State (e.g., prey density, quantity of flow, salinity)**
- **Time Frame (time expected to achieve objective)**
- **Confidence the Quantity or State are sufficient to achieve objective (measure of uncertainty)**
- **Potential Covariate in Unmanaged Stressors (role of "other" stressors in impacting quantity or state).**

Populating the logic chain questions is accomplished principally by use of the Ecosystem Restoration Program's conceptual models for the ecological response of the Delta to various management actions. The Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) scientific evaluation process uses existing conceptual models to evaluate each of the conservation actions for each species. A synthesis team was then assembled to identify multiple benefits or conflicts between conservation actions and to recommend alternative conservation actions. This work forms the foundation for the Effects Analysis that is required as part of the NCCP/HCP process.

On the surface, the logic chain approach of the BDCP is, to date, the most comprehensive attempt to address multiple stressors. It goes far beyond the tradition threats analyses conducted as part of the Biological Assessments required under the federal ESA. However, the examples offered in the Working Draft are relatively few, inconsistently applied and largely incomplete. This is due, in part, to the complexity of both the problem and the method used to address it; the logic chain process relies on extensive, time-intensive analysis and is fraught with large uncertainties. The incomplete nature of the Draft Plan is also a reflection of the inability of the parties negotiating conservation actions to reach agreement. Thus, while seeming sound, in principle, it is not yet clear that this approach will work.

It is also not clear how multiple stressors are incorporated into the logic chain approach, including the potential conflicts between different efforts to mitigate certain stressors. Presumably this is part of the analytic process (and outlined in the DRERIP models), but until more fully worked examples are made available this confusion will persist.

4. If stressors are prioritized, describe the general approach.

Although the authors of the BDCP may disagree, it appears that there is no mechanism for prioritizing stressor management. This may be inherent to ESA and NCCP/HCP requirements.

5. How might this approach be relevant to Bay Delta?

This is directly relevant to the Delta.

6. Follow up regarding additional questions/literature review/etc?